

REMARKS/ARGUMENTS

Favorable reconsideration of this application, as presently amended and in light of the following discussion, is respectfully requested.

Claims 1 and 90-140 are presently pending in this application, Claims 133-140 added by way of the present amendment.

In the outstanding Office Action, Claims 1, 90-96, 100-110, 113-115, 117-129, 131 and 132 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. 5,586,006 to Seyama et al. in view of U.S. 5,912,210 to Hwang et al.; Claims 98, 112, and 130 were rejected under 35 U.S.C. 103(a) as being unpatentable over Seyama et al. and Hwang et al. and further in view of U.S. 4,418,857 to Ainslie et al.; and Claim 99 was rejected under 35 U.S.C. 103(a) as being unpatentable over Seyama et al., Hwang et al., Ainslie et al. and further in view of JP 58-030175 to Watanabe.

First, Applicants wish to thank Examiner Chambliss for the August 18, 2009 telephone discussion at which time the amendments and arguments substantially as indicated herein were discussed. Examiner Chambliss indicated that these amendments and arguments would be fully considered upon filing of this response.

I. Request for Reconsideration of Rejected Claims or Discussion of Amendments that the Examiner Deems Necessary to Clarify Distinctions Discussed Herein

Applicants respectfully submit that the rejected claims are patentable over the cited references for the reasons discussed below. While Applicants believe that the remarks provided herein should result in allowance of the claims in their present form, the Examiner is requested to contact the undersigned Attorney of Record, Ed Garlepp, at (703) 412-5920, to discuss any amendments deemed necessary to clarify the distinctions discussed herein and place this case in condition for allowance. For example, Applicants submit that newly added Claims 133-140 provide further distinctions over the cited references and may be allowable.

However, as the rejected claims in this case are *not* amended herein, this response cannot “necessitate a new grounds of rejection,” and a *forthcoming Office Action including the new grounds of rejection for any unamended claim cannot be properly made final*.

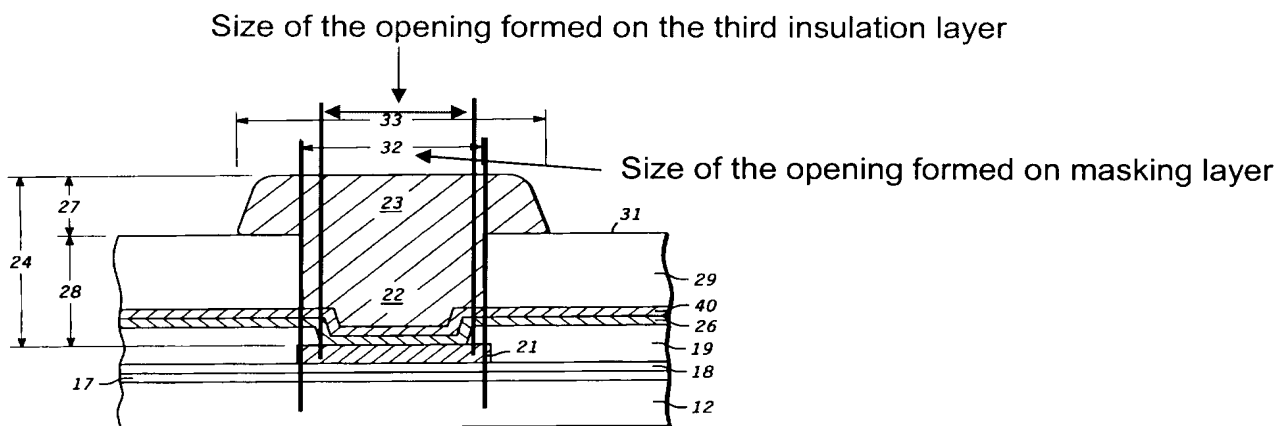
II. The Cited References Do Not Teach or Suggest The Features of Independent Claims 1 and 103

Independent Claim 1 recites “...the solder being disposed over at least one metal layer formed *only* in the partially exposed portion of the pad structure.” Independent Claim 103 recites a similar feature. The Office Action admits that the primary reference to Seyama et al. does not disclose this feature, but cites Fig. 1 of Hwang et al. as correcting this deficiency. Hwang et al. discloses an improved bonding structure for joining two components. Fig. 1 of Hwang et al. shows that the crown region 23 of the bonding structure is locked within the conductive material to securely hold the substrate 12 and component 11 together. As explained in the telephone discussion, however, Fig. 1 of Hwang et al. shows the interrelation of the components 12 and 11, without providing details of the metal layers 26, 40 in relation to the opening. For a picture or drawing to be sufficiently enabling to put the public in the possession of the article pictured, it must show *all* the claimed structural features *and* how they are put together.¹ Thus, Fig. 1 itself does not provide enabling disclosure of the metal layers 26, 40 formed only in the partially exposed portion of the pad structure 21.

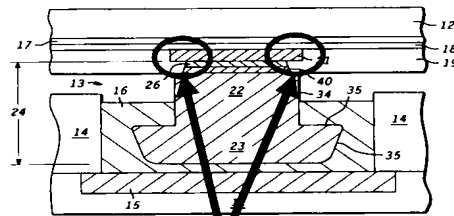
Moreover, the method described in Hwang et al. makes clear that the metal layers 26, 40 are in fact *not* formed only in the partially exposed portion of the pad structure 21. Specifically, col. 3, lines 11-25 of Hwang et al. disclose that the electroplating layer 26 and adhesion layer 40 are formed inside of opening of the third insulation layer 19 *and* on the surface of the third insulation layer 19. This can also be seen in the intermediate process Fig. 2 of Hwang et al. (below). Masking layer 29 is then formed on the adhesion layer 40, as also seen in Fig. 2. Further, it is clear that the size of the opening 32 in the masking layer 29 is

¹ MPEP 2121.04 and 2125 (emphasis added)

larger than the opening formed in the third insulation layer 19, as demonstrated by the dimension lines added to Fig. 2 below.

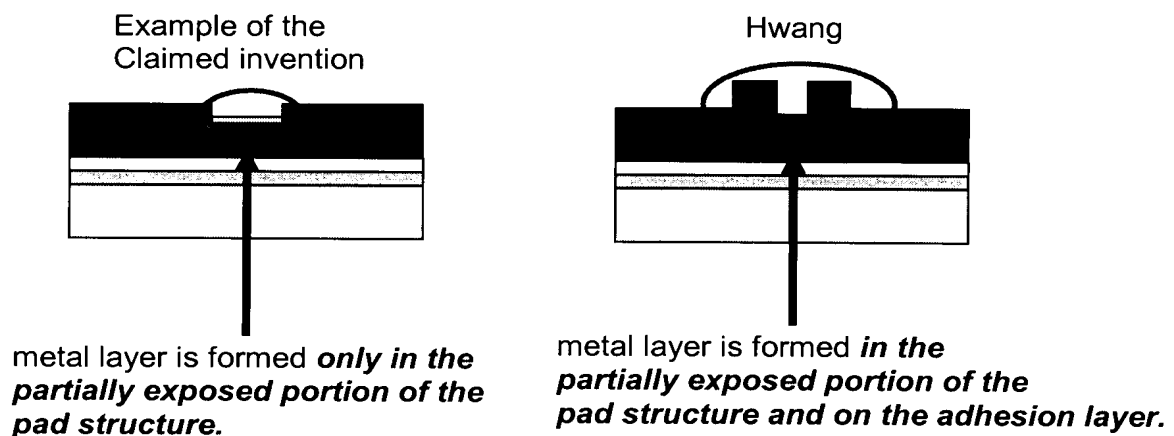


Col. 3 lines 32-42 of Hwang et al., explain that bump 22, 23 is formed inside of the opening of masking layer and on masking layer 29. The masking layer is then eliminated (see Hwang et al., at col. 4, lines 2-4), to expose portions of the adhesion layer 40 formed over the electroplating layer 26, which are then removed (see Hwang et al. at col. 4, lines 4-6). That is, since only portions of the layers 26 and 40, which are exposed after eliminating the mask, are removed, the portions of the electroplating layer 26 and adhesion layer 40 covered by the bump (i.e. never exposed) will actually remain underneath the bump. Thus, Fig. 1 of Hwang et al. does not accurately reflect the cross-sectional view. **To be accurate, electroplating layer 26 and adhesion layer 40 should be shown in between bump and the third insulation layer in the circled regions of Fig. 1 of Hwang et al. shown below.** These details are simply not provided in Figure 1 of Hwang et al. because the invention in Hwang et al. relates to the bonding structure (22, 23 and 16) and not the layers 26 and 40.



Metal layers 26 and 40 in Hwang should be shown on the third insulation layer as well.

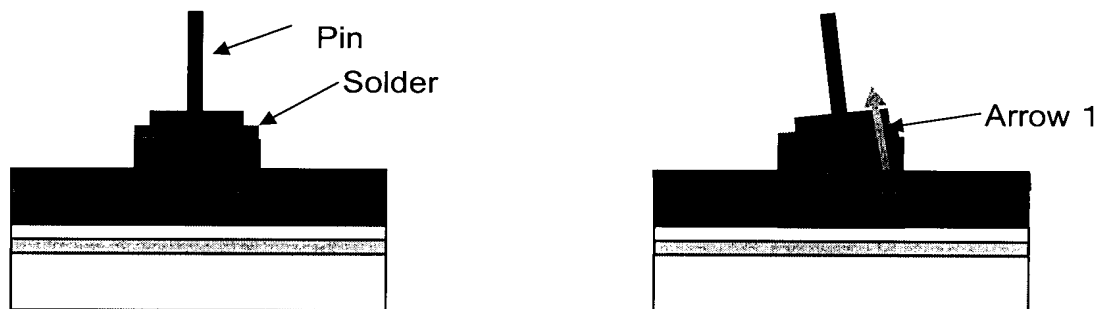
Thus, the structure of the claimed invention differs from that disclosed in Hwang et al. as follows:



As seen in the above figures, in the example of the claimed invention, the metal layer is formed only in the partially exposed portion from the opening, while in Hwang et al., the metal layer is formed both in the partially exposed portion from the opening and extends on the surface of the third insulation layer.

In this regard, Applicants submit that the structure disclosed in Hwang et al. is also inferior to that of the claimed invention. The figures below show a printed wiring board having a pin soldered on a metal layer having the structure disclosed in Hwang et al. When this printed wiring board is connected with other basic substrates by way of the pin, a diagonal force may be applied to the pin as shown by the arrow in the right side figure below.

Since the structure of Hwang et al. includes the metal on the surface of the solder resist, the diagonal force is applied to the solder resist through the metal layer, and the solder resist is easily removed thereby allowing the pad to peel away from the printed wiring board. By contrast, the claimed invention does not recite the metal layer formed on solder resist, so any diagonal force on the pin will not be applied to a surface of the solder resist, for example. That is, in the example of the invention, solder resist holds the pad down and thus makes it difficult to come off from the printed wiring board. This provides an additional reason for patentability of the claimed invention over the combination including Hwang et al.



For the reasons discussed above, the combination of Seyama et al. and Hwang et al. do not disclose "...the solder being disposed over at least one metal layer formed *only* in the partially exposed portion of the pad structure" as required by Claims 1 and 103. Moreover, the references to Ainslie et al. and Watanabe are not cited to, and do not, correct the deficiencies of Seyama et al. and Hwang et al. Thus, Claims 1 and 103 are believed to be allowable.

III. The New Dependent Claims Further Distinguish Over the Cited References

As dependent Claims 90-102 and 104-140 depend from either Claim 1 or 103, these claims are also allowable for substantially the same reasons set forth above for Claims 1 and 103. Nevertheless, new Claims 133-140 have been added to recite additional features which

provide a further basis for patenting over the cited references. Each of these claims recites further details of the “solder being disposed over at least one metal layer formed *only* in the partially exposed portion of the pad structure” feature discussed above. Thus, as discussed in the interview, even if Claims 1 and 103 are rejected, Claims 133-140 should be indicated as allowable.

In view of the amendments and discussions presented above, the present application is believed to be in condition for allowance, and Applicants respectfully request an early and favorable action to the effect.

Respectfully submitted,

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